

## Early *Samotherium* and early *Oioceros* from an Uppermost Vindobonian fossiliferous pocket at Mordaq near Marāgheh in N. W. Iran

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With 2 text figures and plate 2

### Summary

Description of a new subspecies of *Samotherium* (a Palaeotragine Giraffid), found together with remains of an antelope, *Oioceros rothii* (WAGNER, 1860) in a small pocket of red brown volcanic tuff along an irrigation channel near the village of Mordaq (= Murdi), about 20 km E. of Marāgheh in E. Azerbaidjan, Iran. The probable age of the deposit, in which absolutely no remains whatever of *Hipparion* have been found, should be estimated as somewhat older than that of a tuffaceous rock in its vicinity, occurring at a slightly higher level and having a K-Ar age of  $12.9 \pm 0.7$  Ma.

### Résumé

Description d'une nouvelle sous-espèce de *Samotherium*, trouvée en compagnie avec des restes d'*Oioceros rothii* (WAGNER, 1860), bovidé caprine, dans une petite lentille de tuf volcanique rouge au bord d'un khanat près du village de Mordaq (= Murdi) à peu près 20 km à l'Est de Marāgheh en Iran. L'âge du dépôt pourrait bien être vindobonien supérieur; point de restes d'*Hipparion* s'y trouvaient tandis que l'âge K-Ar d'un tuf volcanique aux environs, stratigraphiquement un peu plus haut, fut fixé à  $12.9 \pm 0.7$  millions d'années.

### Zusammenfassung

Beschreibung einer neuen Subspezies von *Samotherium* (Palaeotraginae, Giraffidae), die zusammen mit Überresten einer Antilope, *Oioceros rothii* (WAGNER, 1860) in einer kleinen Linse rotbraunen Tuffs am Rande eines Bewässerungskanals in der Nähe des Dorfes Mordaq (= Murdi), ungefähr 20 km östlich von Marāgheh in Ost-Aserbeidschan, Iran gefunden wurde. Das wahrscheinliche Alter der Ablagerung, in der überhaupt keine Reste von *Hipparion* gefunden wurden, kann geschätzt werden als etwas früher als dasjenige eines benachbarten geschichteten Tuffs, der sich auf etwas höherem Niveau befand und ein K-Ar Alter von  $12.9 \pm 0.7$  Ma hatte.

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## Introduction

In an earlier paper (Bosscha Erdbrink et al., 1976) particulars have been given on the region around Marāgheh, in the province of E. Azerbaidjan, Iran, where a party of three investigators, consisting of Dr. N. SCHMIDT-KITTLER of the Institute for Paleontology and historical Geology of Munich University, Mr. S. A. P. L. CLOETINGH of the Vening Meinesz Laboratory for Geophysical Research of Utrecht University, and the present author, carried out research in 1973.

Not far from our camping site at the water mill above the village of Mordaq, some 20 km East of the town of Marāgheh, our local helper and collector Now Ruz discovered a small pocket of reddish brown volcanic tuff with some gravel as admixture, at the eastern edge of a poplar plantation, in the side of a bank of the lower of two irrigation channels. Near Mordaq (also called Murdi), this lower channel forks off from a main channel running down from Kerjābād (= Kirdjawa) to Mordaq and beyond. The pocket, some 300 metres downstream along the channel or khanat from our paleomagnetic sampling site I—Ib (a tuffaceous rock some 1—1½ metres above the water table of the channel at that place), contained a mass of much-weathered fossil bone fragments, most of which were too fragmentary to permit any determination. However, six of the collected fragments could be determined as being of a Giraffid nature (almost certainly all belonging to one single specimen), while seven other fragments, containing teeth, could all be ascribed to a single bovid species. It was considered peculiar by us at the time that absolutely no teeth or other recognizable remains of *Hipparion* were recovered from the fossiliferous pocket, whereas most other fossil localities in the area contained an abundance of fossil remnants of this genus. Later absolute age determination (K-Ar) of the volcanic tuff of paleomagnetic site I—Ib resulted in an age of  $12.9 \pm 0.7$  Ma. The arrival of the genus *Hipparion*, more especially the primordial Old World species *H. primigenium* (VON MEYER), in Eurasia from North America is usually placed at about 12.5 Ma ago (VAN COUVERING and MILLER, 1971, p. 56; HOOIJER and MAGLIO, 1974, p. 30; HOOIJER, 1975, p. 7), and therefore the total absence of this equid in the fossiliferous pocket at Mordaq probably indicates an age of this deposit which is just slightly older than the first date of occurrence in Iran of the new American immigrant. An abbreviated compilation of the stratigraphic column published in Bosscha Erdbrink et al., 1976, in which the level of the fossil locality E. of Mordaq under discussion in the present paper is indicated with its relation to the levels and ages of other localities and sites in the area around Marāgheh, is given here as textfigure 1.

The described fossils all form part of the Bavarian State collection for Paleontology and historical Geology at Munich and, accordingly, they have been numbered following the rules in use at that collection.

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Textfig. 1: Abbreviated compilation of the stratigraphic column published in BOSSCHA ERDBRINK et al., 1976, with the appropriate paleomagnetic polarities and the absolute (K-Ar) ages, of a 80 metres thick section of the fossiliferous and volcanic deposits East of Marāgheh, N. W. Iran.

	site VII; Sargezeh	Polarity: R
		$8.1 \pm 0.4$
	site II; above Gürt Daresi.	Polarity: N
	site III; above locality K2	Polarity: R
		$8.7 \pm 0.4$ Ma
	level of locality K1	
	site IV; top of Zuglêh gully.	Polarity: ?
	level of localities K2, Gürt Daresi, Çi Annêh, Âliabâd-North, Güzgünêh	
X	isolated find of deciduous tooth of Mastodon, Çi Anne	
	level of localities at Sargezeh, Kerjâbâd cemetery, gully E. of Âliabâd	
X	isolated tusk of Mastodon, S. of Âliabâd site V; S. of Âliabâd.	Polarity: N
		$14.4 \pm 0.7$ Ma
	site I & Ib; along irrigation channel N.E. of Mordaq.	Polarity: ?
		$12.9 \pm 0.7$ Ma
	level of locality E. of Mordaq	
	site VI; along irrigation channel S.E. of Âliabâd.	Polarity: N
	site VIII; along irrigation channel N.W. of Mordaq.	Polarity: N

## Description

The six Giraffid remains, numbered 1973 XXI 70 up to and including 75, consist of a nearly complete horn, broken off from the skull at its base (number 70), a small fragment of a mandible of the left side (number 71) containing a very worn  $M_1$  (which still possesses its posterior root, the anterior one having broken off), a nearly complete naviculo-cuboid of the left side (number 72), only slightly damaged along its upper posterior edge, the lower part with the several articular facets of a right calcaneum (number 73) from which the shaft and the tuber calcanei are missing, and a quite complete naviculo-cuboid with its cuneiform bone, of the right side (numbers 75 and 74, respectively). These last two bones, joined together after their preparation, closely fit the appropriate articular facet of number 73, the right calcaneum, so that they evidently belong together. The following measurements have been taken by me from the six specimens:

<i>Horn</i> , no. 70: total height	202	mm
length of polished facet at tip	32	mm
length at base of its mesial (upper) side	73	mm
length of mesial side at height of 10 cm	37	mm
transversal width at base (perpendicular to length)	52	mm
transversal width at height of 10 cm	27	mm
$M_1$ sinister, no. 71: length (at base of enamel)	34.5	mm
width (at base of enamel)	25.1	mm

<i>Naviculo-cuboid sin.</i> , no. 72:	and id., <i>dext.</i> , no. 75:
sagittal width 64 mm	and 64 mm
transversal width 76 mm	and 75.5 mm
height 58 mm	and 58.5 mm

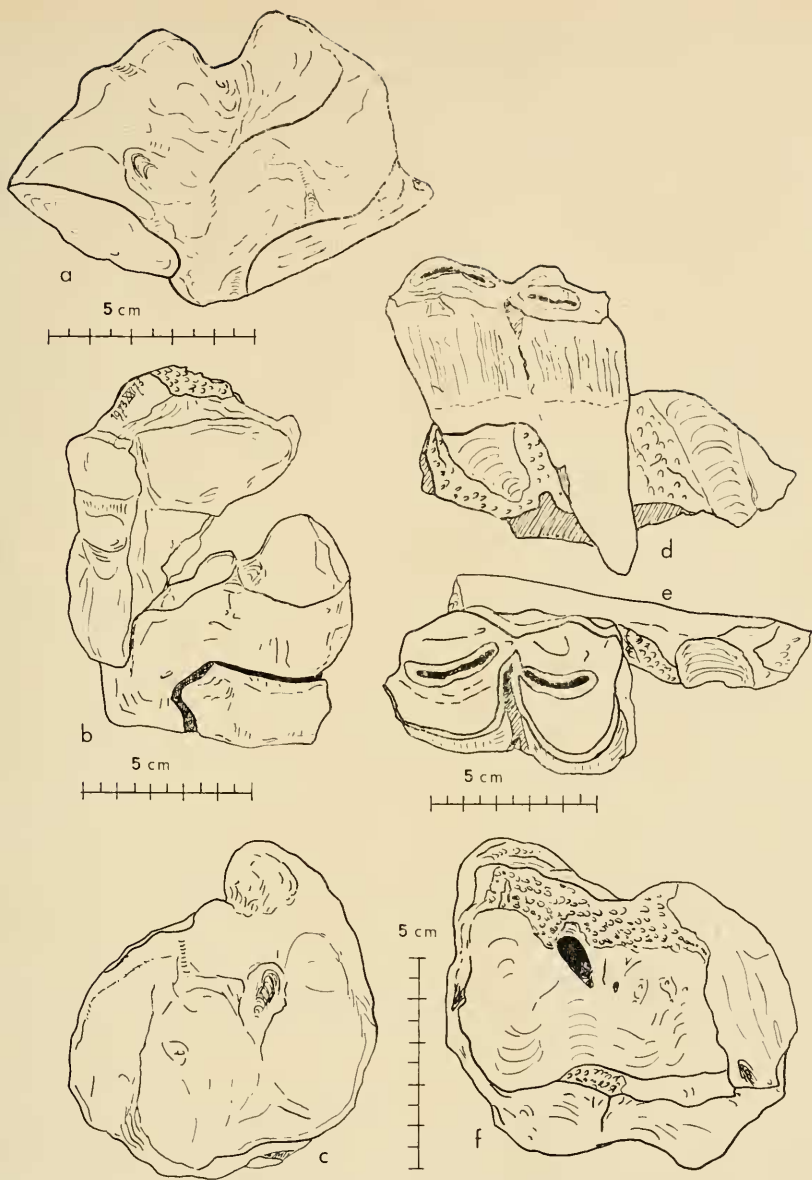
<i>Calcaneum dexter</i> , no. 73:	
transversal width over articular facet for astragalus	54 mm
maximum height of shaft near this place	58 mm
maximum height at distal side of articulation	76 mm

<i>Cuneiform dexter</i> , no. 74: transversal width	53	mm
sagittal width	34	mm
height	17.5	mm

All these bones are somewhat caramel-coloured with dark grey streaks and spots in several places, while patches of ivory white occur also.

The horn, which has probably been connected to the skull somewhere above the orbit, is triangular in cross-section at its base. The basis of this triangle most probably has been situated along the upper (mesial) side of the horn's base while the horn was in its natural position, i. e. that of an oblique appendage of the skull above the eye.

When seen from below, one looks into the horn in a kind of honeycomb of large and small cells and hollows, each bordered by quite massive walls. This is probably a prolongation of the "inflated", sinus-rich growth of the skullbones



Textfig. 2: *Samotherium mongoliense nowruzi* n. subsp.: a. Calcaneum dext., 1973 XXI 73, seen from sagittal to distal; compare with BOHLIN, op. cit., pl. IX, fig. 2. b. Calcaneum, naviculo-cuboid and cuneiform dext. in natural relation to each other, seen from in front (numbers 1973 XXI 73, —75 and —74). c. Naviculo-cuboid dext., 1973 XXI 75, mesial surface. d. and e.  $M_1$  sin. in fragment of mandible, 1973 XXI 71: buccal aspect (d) and occlusal aspect (e). f. Naviculo-cuboid sin., 1973 XXI 72, mesial surface, slightly tilted.

above and near the orbits. From its base upwards the horn tapers gradually to its tip, while its section changes in form from triangular to oval. A number of straight furrows run from the tip to the base. The sides of the triangle, when a transverse (cross-) section is meant, form more or less pronounced keels from the base to the tip of the horn, becoming less distinct near the tip. One of these keels, presumably along the posterior side of the horn (*vide infra*), if the orientation according to Bohlin is accepted as the correct one, is projected outwards as a knobby outgrowth over some 7 centimetres roughly at the middle of the horn. The rounded, knoblike tip and the extreme three to four centimetres of the horn show a slight curvature. If, as does BOHLIN (1927, p. 88), it is considered that this curvature goes in a backward direction, the horn most probably is one of the right side. This also appears to be very probable in view of BOHLIN's textfigures 137, 136 and 135 on p. 84, op. cit. A highly polished facet just below the tip of the horn would then lie on the underside and somewhat facing the outside, with respect to the position of the skull, a situation which does appear to be natural if the animal has been in the habit of whetting its horn against trees or branches. On the other hand, if GODINA (1962, p. 132, fig. 1) is to be believed, the way in which the horn is curved would indicate its being a horn of the left side; in the *Samotherium irtyschense* described there, the horn ends in a knob also.

In contrast to the description of the horn of *Samotherium boissieri* given by BOHLIN (loc. cit.), the horn of the Mordaq specimen does not become less thick quickly in the first ten centimetres from the base upwards, and from there only in a gradual manner to the tip; the thickness of the horn from Mordaq diminishes gradually from base to tip.

The  $M_1$  sinister in its small fragment of the mandibula (in fact only a piece of the tabula interna) still possesses its complete posterior root, this having a length of some 2.5 cm. The anterior root has broken away together with some of the enamel of the molar itself on its mesial side. The molar is much worn, but one may still observe the so characteristical fine giraffid wrinkles of the enamel. There are no traces even of a cingulum, nor of small pillarlike additional structures. The reader is referred to textfigures 2d and 2e. There exists a certain likeness with GODINA's *Samotherium mongoliense* (1959, p. 98, fig. 1), but it is difficult to decide whether the greater buccolingual width of the Mordaq specimen is only due to its having been worn down much farther. In each of the two cases, however, the posterior half of the molar is decidedly its broader part also, while, on the contrary, in *S. irtyschense* GODINA (1962, p. 133, fig. 2), the two halves of the  $M_1$  are about equally wide and possess additional pillars on the anteriormost and posteriormost lingual corners.

The morphological description of the naviculocuboid (= "centerotarsale") given by BOHLIN (op. cit., pp. 70—71) of *Samotherium* fits the Mordaq specimina numbers 72 and 75 nicely. So does that of the cuneiform bone (Tarsalia II and III, BOHLIN p. 71) and that of the calcaneum (BOHLIN, p. 70). In the last case it should be stressed that the Mordaq specimen, no. 73, also has an articular facet for the naviculocuboid which curves outwards at its anterior, and slightly inwards at its posterior end, the whole occupying an angle of roughly 30 degrees, while it does not possess an accessory articular facet at its posterior internal side (as is the case with *Giraffa*, see BOHLIN, loc. cit.).

Seven more specimens from the same locality all belong to antelopes. The



colour and state of preservation of the bone and the teeth is the same as that of the already described giraffid remains. These bovid specimens are the following: 1973 XXI 88: a mandibula sinistra, broken almost near the symphysis without, however, possessing the alveoli for the canine and the incisors, while at its distal end the jaw is broken vertically behind  $M_3$ . The dental elements present consist of  $P_2$  up to and including  $M_3$ . They show moderate wear.  $M_1$  is the most worn tooth in the row and it appears to have risen some 4 mm out of its alveolus, as can be seen at the lingual side of the jaw when its position is compared to that of  $P_4$  in front of it and  $M_2$  behind it. This might possibly indicate some pathological influence such as a mandibular abscess, although no other indications for this can be observed, or lack of wear through absence of the opposing teeth of the upper jaw.  $P_2$  and  $M_3$  are hardly or barely worn. At the time of its death the animal must have been adult, but still fairly young. Judging from the degree of wear of  $M_3$ , the teeth of this antelope show a moderate hypsodontism. The lingual border of all the molars and premolars consists of a vertical nearly flat enamel wall with very few marked features and thereby resembles the corresponding teeth of sheep.  $M_2$  and  $M_3$  have a pronounced anterior external enamel fold (lacking in  $M_1$ ), while small but distinct anterointernal and posterointernal enamel folds exist in  $M_1$  and  $M_2$ ,  $M_3$  having an anterointernal fold too. The main pillars of the teeth are cylindrical; no traces of accessory tubercles or of pillars in between are present. The third, posteriormost, fold of  $M_3$  is nearly cylindrical also, although it tapers slightly towards the top. Its occlusal surface is semilunar to rounded triangular in outline, with the flat side (the base of the triangle) at the lingual side and almost directly prolonging the lingual wall of the rest of the molar, forming an angle with this of some 160 degrees. The premolars nicely follow the description given by SCHLOSSER (1904, p. [52] = 72) for his "second type".

1973 XXI 89 is a fragment of a left mandibular ramus still containing  $M_2$  and  $M_3$  in an almost identical state of wear as no. 88, while the morphological description is the same also.

1973 XXI 90 is an isolated  $M_3$  sinister, which has had three roots with only the one in front still partly present. Although slightly more worn than the specimens 88 and 89, the morphological description of  $M_3$  given there nicely agrees with this specimen too.

1973 XXI 91 is an upper fragment of a right mandibular ramus still containing the hindmost pillar of  $M_2$  and the two anterior pillars of  $M_3$ , again exactly fitting the description given of specimens 88 and 89 and also showing the same amount of wear.

1973 XXI 92 is an isolated  $M^3$  dexter, barely worn, the roots of which are broken away. Here also the description given by Schlosser (1904, loc. cit.) of his "second type" fits this moderately hypsodont molar with no accessory pillars or tubercles. So does the description of its counterpart there agree with

1973 XXI 93, an isolated  $P^3$  or  $P^2$  sinister still in possession of the larger part of its two roots, and moderately worn, while

1973 XXI 94, being only the external enamel surface of a  $M^2$  sinister, is very well in accordance with the morphology of the same surface of number 92, the  $M^3$ .

From this description it appears that the specimina 88 up to and including 94 should all be ascribed to one and the same species of antelope. The following measurements have been taken:

	no. 88 (mm)	no. 89 (mm)	no. 90 (mm)	no. 91
P <sub>2</sub> , length × width	5.9 × 3.5			
P <sub>3</sub> , length × width	8.0 × 5.1			
P <sub>4</sub> , length × width	9.4 × 5.8			
M <sub>1</sub> , length × width	10.0 × 8.2			
M <sub>2</sub> , length × width	14.2 × 10.1	14.8 × 9.6		— × 9.8
M <sub>3</sub> , length × width	19.8 × 9.3β)	19.2 × 8.6α)	20.1 × 9.1α)	— × 9.3β)
Mandibular height below M <sub>1</sub> and M <sub>2</sub> }	22.5 mm	id., between M <sub>1</sub> and M <sub>3</sub> }	24.5 mm	α) = over first pillar β) = over second pillar

no. 92: M<sup>3</sup>d, length × width: 16.0 × 15.0 mm; height: 18.5 mm.

no. 93: P<sup>3</sup>or P<sup>2</sup>sin., 1. × w.: 9.1 × 6.9 mm.

no. 94: M<sup>2</sup>sin., length: 16.5 mm; height: 18.6 mm.

Total rectilinear length of the series P<sub>2</sub>—M<sub>3</sub> in no. 88: 69 mm.

## Determination

In the case of the giraffid remains it will be clear from what has already been stated in the description, that all recognizable morphological features concur to indicate that the remains have to be ascribed to a species of the genus *Samotherium* FORSYTH MAJOR, 1888. One has only to read BOHLIN's analysis (op. cit.) of the several separate bones and of the form of the molar, to be convinced.

All the same, the size of the several pieces is much too small for a determination as one of the common species of *Samotherium* from Samos or from Chinese localities, as well as for that of the species known from Marāgheh, *S. neumayri* (RODLER & WEITHOFER, 1890); the Chinese species *S. sinense* (SCHLOSSER 1903) is probably synonymous with *S. neumayri*, as has been stated elsewhere by me (BOSSCHA ERDBRINK, 1976, in press).

Together with the circumstance that the age of the fossil remains, uppermost Vindobonian or rather Aragonian, is older than that of the larger ("Pontian") species so that a smaller size for a somewhat earlier form is to be expected, this makes it necessary to enquire into the possibility whether any other *Samotherium* remains having a possibly Vindobonian age have already been described.

Two such finds, both from Central Asia, are known. They were already mentioned in the descriptive part of the present paper: *S. mongoliense* and *S. irtysbense*, the first one described by GODINA in 1954 and 1959, and the second, also by her, in 1962. Each species is said to come from deposits which are "uppermost Miocene or earliest Pliocene", Mongolian in the first case and, in the second case, occurring near Pawlodar in Kazakhstan. Although the material on which each of these two species is based cannot be considered plentiful, so that, given a



certain (as yet unknown) width of individual variation, the possibility might exist that *irtyschense* is only a synonym for *mongoliense*, it is clear that these *Samotheria* are decidedly smaller than the well-known forms *S. boissieri*, *S. neumayri* or *S. sinense* while their stratigraphical age at the same time is probably older as well. If the specimen from Mordaq, on the other hand, is compared with the animals described by GODINA, the resemblance of its horn with that of *S. irtyschense*, already remarked upon, cannot be denied. Neither can the morphological likeness of the Mordaq  $M_1$  with the (slightly damaged)  $M_1$  of *S. mongoliense* in GODINA's 1959 paper, although there its dimensions ( $36 \times ?$ , app. 22, mm) are slightly different from those of the Mordaq specimen with regard to the relations between length and width. The Mordaq molar has a somewhat plumper aspect. The  $M_1$  of *S. irtyschense* is morphologically different, and also larger ( $37 \times 26$  mm). The fact that such differences, albeit small ones, exist, together with the deplorable circumstance that so little material of these small and ancient types of *Samotherium* is known, constitute sufficient reason, in my opinion, to keep the form recovered at Mordaq provisionally apart. Its practically undoubted age, its relatively small size, and its morphological resemblance to the first form described by GODINA compel me to place it in the same species, from which I propose to keep it distinct by according it a different subspecific name. In honour of its discoverer, an inhabitant of the village of Mordaq, I would like to name it *Samotherium mongoliense nowruzi* n. subsp., thereby relegating the Mongolian find provisionally to *S. mongoliense mongoliense*. The Mordaq material, all of it presumably belonging to a single individual specimen, and numbered 1973 XXI 70 up to and including -75, should be considered as the type specimen for the subspecies *nowruzi*. It forms part of the Bavarian State Collection for Paleontology and historical Geology in Munich.

With respect to the antelope remains from the Mordaq locality a serious impediment to correct determination is constituted by the total lack of any fossil horncores. A lucky circumstance is provided by the fact that DE MECQUENEM has given a description of the dental elements of several species of the genus *Oioceros*, as he was in possession of complete skulls with horncores and teeth (1925, pp. 40—42, pl. VI, 2, 4, and VII, 2—8). The flatness of the general aspect of the internal (lingual) side of the lower teeth has been remarked upon in the description in the present paper. DE MECQUENEM has observed the existence of an anterior and a posterior "pli" on the internal side of the lower molars of *O. rothii*, while  $M_2$  and  $M_3$ , according to this description, show an anterior fold to the first pillar ("lobe") as well, but no accessory tubercles in the external valleys. Comparison with the material from Mordaq with his description demonstrates convincingly, in my opinion, that the fossil antelope accompanying the remains of *S. mongoliense nowruzi* cannot be other than *Oioceros rothii* (WAGNER, 1860). Wagner, the describer of the species, definitely wrote the name as *Rothii* (op. cit., p. 154), not *Rothi* as is done by subsequent authors, while his paper was published in 1860, and not in 1857 as is erroneously mentioned by RODLER and WEITHOFER (1890, p. 768, footnote) and probably cited from these two authors by PILGRIM and HOPWOOD (1928, p. 24, also using the wrong specific name *rothi* and giving the incorrect plate number, VI instead of VIII).

RODLER and WEITHOFER (op. cit., pp. 770—771, Pl. IV) very briefly described and figured some fossil teeth of different antelope species collected near Marāgheh.

As they did not know the correct combinations of the isolated horn-cores with the teeth, they refrained from specific determinations of the dental elements, giving only some tentative suggestions, amongst others also with respect to their species *O. atropatenes* (described by them as *Antidorcas atropatenes* from a number of horn-cores). The identification, thanks to more complete material, made by DE MECQUENEM (op. cit.) at a later date, shows beyond doubt that the mandibular fragment, figured by RODLER and WEITHOFER on their Plate IV, fig. 6, should be ascribed to this *O. atropatenes*. The describers state (p. 768, op. cit.) that their animal is markedly smaller than the species *rothii* (at that time only known from Pikermi, and not found by them near Marāgheh), apart from slight differences in form of the horn-cores which are immediately apparent to any observer. As was remarked by SCHLOSSER (1904, p. 51), GAILLARD has shown the inaccuracy of the ascription of the species *rothii* WAGNER, 1860, and *atropatenes* RODLER et WEITHOFER, 1890, to the genus *Antidorcas*. To correct this the generic name *Oioceros* was instituted by GAILLARD in 1901. For the insufficient reason that he considered the figure of *O. rothii* given in WAGNER's description to be very bad in quality, SCHLOSSER (loc. cit.) altered the specific name in *rothi*, a procedure which is of course invalid. A third specific name, *proaries*, was given by SCHLOSSER to a number of finds (a hornless skull, some bones of the extremities, and some teeth) of an *Oioceros* from Samos. The very detailed description (op. cit., pp. 73 = [53] — 76 = [56]) and the figures indeed demonstrate the existence of some differences between *proaries* and *rothii* (e. g. the greater length of the upper and lower premolars), although the general size is almost identical. Again it is stated that *atropatenes* from Marāgheh is a smaller animal (op. cit., p. 74 = [54]). PILGRIM and HOPWOOD (op. cit., pp. 25—26) suggest that another species, *wegneri*, described by ANDREE (1926) from a male skull found in Samos, may very well be synonymous with SCHLOSSER's *proaries*, this being a female skull. In view of the general agreement in size, the many points of resemblance, while the mainly dentitional morphological differences are all of a secondary nature only, I would like to suggest here that the Pikermi and Marāgheh species *Oioceros rothii* (WAGNER, 1860) and the Samos species *Oioceros proaries* SCHLOSSER, 1904 (probably incorporating *O. wegneri*, ANDREE, 1926) are, in reality, a single species with only minor, perhaps subspecific, differences. It seems highly unlikely, from a biological point of view, that one or two separate species of *Oioceros* should have existed at one locality only, right within the range of another *Oioceros* of the same size and almost the same morphological type; of course, when it is assumed that there exists stratigraphical contemporaneity. Future additional data and material may perhaps furnish proof for this supposition.

It is an undeniable fact that the second species of *Oioceros* from Marāgheh, *O. atropatenes*, is smaller than *O. rothii*. Both its dental elements, and its overall size, measure significantly less. The remark made by PILGRIM and HOPWOOD (op. cit., p. 25) about their specimen of *O. rothii* from Pikermi being smaller than "*Oioceros atropatenes* (RODLER)" is therefore incomprehensible. So is their statement that the horn-cores in question are, on the other hand, "considerably larger than those on the frontlet from Maragha figured by DE MECQUENEM (1925, pl. VII, fig. 4) and referred by him to this species" (e. g., *rothii*). The indicated specimen figured by DE MECQUENEM (at half its natural size, while other

specimens on the same plate are figured natural size) has almost the identical size, and shows the identical morphology, as WAGNER's type specimen.

Summing up, three different species of the genus *Oioceros* appear to have existed in the region around Marāgheh: *O. rothii rothii* (WAGNER, 1860), the largest form, identical with that known from Pikerimi and perhaps only differing subspecifically from the equally large form found in Samos; *O. atropatenes* (RODLEDER et WEITHOFER, 1890), of medium size; and *O. boulei* DE MECQUENEM, 1925, the smallest of the three. The first and largest form occurs only in the two lower fossiliferous levels of the area of our 1973 research: at Mordaq and at Aliābād (see text-fig. 1). The other two species occur in the upper three levels of fig. 1, *Oioceros boulei* becoming rather common at the Turolian localities K2 and K1.

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### References

- ANDREE, J.: Neue Cavicornier aus dem Pliocän von Samos. — *Palaeontographica*, 67, 6, 135—175, 7 pls., 4 figs., 6 tabs., Stuttgart 1926.
- BOHLIN, B.: Die Familie Giraffidae. — *Pal. Sinica*, Ser. C, 4, 1, 178 pp., 12 pls., 254 textfigs., Peking 1927.
- BOSSCHA ERDBRINK, D. P., PRIEM, H. N. A., HEBEDA, E. H., CUP, C., DANKERS, P. and CLOETINGH, S. A. P. L.: The bone bearing beds near Marāgheh in N.W. Iran. I & II. — *Kon. Ned. v. Wet. Amsterdam*, Ser. B, 85—113, 5 figs., 3 tabs., 2 pls., 1976.
- BOSSCHA ERDBRINK, D. P.: A Collection of Mammalian Fossils from S. E. Shansi, China. V. Family Giraffidae. — (In press) *Publ. Natuurhist. Genootsch. Limburg*, 1976; 1 tab., 1 pl.
- GAILLARD, CL.: Le Bélière de Mendès. — *Bull. d. l. Soc. d'Anthrop. de Lyon*, 1901, XX, 69—103, 8 figs., Lyon 1902.
- GODINA, A. YA.: (New discovery of a fossil giraffe of the genus *Samotherium*) (In Russian, w. French résumé). — *Vertebrata Palasiatica*, III, 2, 97—103, 1 fig., 1 tab., Peking, June 1959.
- GODINA, A. YA.: (A new species of *Samotherium* from Kazakhstan) (In Russian). — *Paleontol. Zhurn.*, 1, 131—139, 3 figs., 5 tabs., 1962.

- HOOIJER, D. A. and MAGLIO, V. J.: Hipparions from the Late Miocene and Pliocene of Northwestern Kenya. — Zool. Verhandelingen, 134, 34 pp., 8 pls, 2 figs., 11 tabs., Leiden, 24 Okt. 1974.
- HOOIJER, D. A.: Miocene to Pleistocene Hipparions of Kenya, Tanzania and Ethiopia. — Zool. Verhandelingen, 142, 80 pp., 10 pls., 1 fig., 17 tabs., Leiden, 29 Okt. 1975.
- MECQUENEM, R. DE: Contribution à l'étude des fossiles de Maragha. — Ann. Paléont., 14, fasc. 1, 1—35, 5 pls., 6 figs., Paris 1925.
- PILGRIM, G. E. and HOPWOOD, A. T.: Catalogue of the Pontian Bovidae of Europe in the Department of Geology. — British Museum (Natural History), 106 + VII pp., 9 pls., 3 figs., London 1928.
- RODLER, A. und WEITHOFER, K. A.: Die Wiederkäuer der Fauna von Maragha. — Denkschr. kais. Akad. Wiss., math. nat. Cl., II, 57, 753—772, Wien 1890.
- SCHLOSSER, M.: Die fossilen Cavicornia von Samos. — Beitr. Pal. Geol. Österr.—Ungarns u. d. Orients., Mitt. geol. pal. Inst. Univ. Wien, XVII, H. II, 21—118 (= [1—98]), 10 pls., 16 textfigs., Wien & Leipzig 1904.
- VAN COUVERING, J. A. and MILLER, J. A.: Late Miocene Marine and Non-Marine Time Scale in Europe, — Nature, 230, 559—563, London 1971.
- WAGNER, A.: Neue Beiträge zur Kenntniss der fossilen Säugthier-Ueberreste von Pikermi. — Abh. math.-phys. Cl. K. Bayer. Akad. Wiss., 8 (= Denkschr. Bd. XXXI), 111—158, 7 pls., München 1860.

## Plate 2

- a. Horn of *Samotherium mongoliense nowruzi* n. subsp., 1973 XXI 70. The knobby outgrowth along the posterior (?) keel is seen at the left side.
- b — f. *Oioceros rothii rothii* (WAGNER, 1860):
- b. Mandib. sin., 1973 XXI 88, buccal (above) and occlusal (below) aspects.
- c.  $M_3$  sin., 1973 XXI 90, buccal (above) and occlusal (below) aspects.
- d. Fragment of mandib. sin. with  $M_2$  and  $M_3$ , 1973 XXI 89, buccal (above) and occlusal (below) aspects.
- e. Isolated  $P^3$  or  $P^2$  sin., 1973 XXI 93, buccal (above) and occlusal (below) aspects.
- f. Isolated  $M^3$  dext., 1973 XXI 92, buccal (above) and occlusal (below) aspects.